The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Chemical Age

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Women in Industry

ONE of the most striking changes in the social life of the last half-century has been the part that women have played and are playing in industry and war. With isolated exceptions, we believe it is true to say that civilised women had no place in war until the Crimea, when the devoted work of Florence Nightingale brought into being the nursing services that have done so much to relieve human suffering. Up to the beginning of the present century, however, it was still considered faintly discreditable in certain circles for women to earn their own living, or to work in offices, though women workers in the lower ranks of industry had been common throughout the industrial revolution, and even in coal mines 100-150 years ago. In hosiery, for example, and especially in cotton, women workers were the rule, not the exception.

In the last war women went into both the factories and the Services; their skirts became shorter and they took their place alongside men in many vocations. In this war they have gone into trousers and they have to an even greater degree shared the life of men in all war pursuits, save that of the actual fighting, while an increasing number of women of the nations of eastern Europe have even gone so far as to become active members of the combatant forces. Are we reaching the time when conscription, already applied to women for the auxiliary forces, will be applied to them for the fighting services? The world is reaching a pitch of insanity at which even this is not impossible. When another war comes we may expect to find many services, such as flying combat planes, driving tanks and so forth, for which women will be considered suitable. We hope that this dismal prophecy will not be fulfilled, but if women continue to work in men's jobs in industry, as some feminist leaders seem to desire they should, that day will be brought appreciably nearer. We would, however, raise the query: Do the feminists speak for women as a whole? Is it the average woman's desire to work in factories, on the railways, at the docks, in engineering and chemical works, and so forth? Or do they look forward to a return to home life?

A problem that has worried many a works foreman is how to deal with his women employees in order to get the best out of them. We have recently been reading an American

On Other Pages

report in the September issue of the journal *Argosy*, in which these and other questions are answered for American women through an investigation made for the Consolidated Vultee Aircraft Corporation. This report seems to be regarded on the other side of the Atlantic as highly important, and its conclusions, which have been widely disseminated, are worth studying here.

The primary difficulty which prompted the investigation was that among the women employees absenteeism was five times as great as among the men, and that the labour force change-over was such that 80 per cent. of the women workers had to be replaced annually. The general conclusion reached was that women cannot be treated in the same way as men. When subjected to the same treatment, they do not respond to it—they "quit." Also, happenings outside the factory, such as domestic quarrels, affect women's efficiency most adversely, whereas a man's efficiency is virtually unaffected. The reason for a falling-off in female efficiency is therefore to be found, generally though not invariably, outside the works, whereas if a man is adversely affected the reason is generally something to do with his factory conditions. A man is eager to change his job if it means getting on; promotion is his ambition. The woman—the American woman, at least—prefers the routine job, with the people she is used to, to a change that means promotion. We are not completely sure that this applies equally in this country; somehow we feel that the bulk of British women are more ambitious and self-reliant—but we are open to correction.

Another conclusion from the American investigation is that criticism which succeeds with a man does not "work" with women. Brusque criticism must be avoided and reproofs must be wrapped up with a compliment. Again we wonder. Is it not true that no one likes to receive brusque criticism? Men take it and say nothing—but they may feel aggrieved. Women show their feelings and do something about it. There may be a time for plain speaking to everyone; but when a willing worker has made a mistake or for once has kicked over the traces, the brusque way of dealing with the offender may be the very worst—whether it be man or woman. It is said—and we should be inclined to agree—that competition, with prizes, is less attractive to women than to men. Man is by nature a gambler; how many women regularly "back their fancy," compared with men? The American investigation finds that women become over-excited, and generally lose output instead of gaining it, while those who fall behind in the race get so discouraged that they stop trying and their output drops instead of increasing. We should doubt, too, whether women have the team spirit highly developed, so that a different approach to them is necessary.

The "hearty, bluff" approach "that goes over big with men" does not work with American women; they require the "courtly" touch. Again, we wonder whether this is really so. With a sensitive girl brought up at home, this is almost certainly true, but judging by our own experience it is not true of a great many British women who seem to fit thoroughly well into a man's world. That we can say such a thing may be just because, like other males, we do not understand women. Here, however, is a gem from the original report which we commend to our readers: "Women do badly on a job in which they have to make decisions. There should never be two ways of doing an operation which a woman worker performs. It takes her too long to make up her mind which course to follow." Well, that was written by a woman; we take no responsibility for it. But it indicates, if it is true, a deep and abiding difference between the sexes. We recollect, as another example, a passage in a well-known book (though for the life of us we cannot now recall which book), to the effect that "it is an almost universal feminine thesis that maps are the silly pretensions of man, and not half as good as a pinch of womanly intuition."

The investigation which we have quoted and ventured to criticise mildly may thus be summed up. "Women are primarily interested in being women. Their interest in any other kind of success runs a bad second. . . . Being a man includes making good in a man's world. Being a successful woman seldom includes that at all. Working for wages is something a woman does *until*—until she finds the right man, until the baby

comes, until her man comes home, until Joe makes more money, until their home is paid for, until the war is won." It is admitted that there are exceptions, "but the average woman in a war plant longs for the day when she can stay at home." That is the summing up resulting from an investigation, among thousands of American women, into the attitude of women in industry. There is much else contained in the article which employers of female labour might well read and study with a view to putting it into practice, though account must be taken of such differences in outlook as may exist between American women and British women. The fundamental fact is that women are different from men, and must be treated differently to get the best out of them. We recollect a debate in the French Chamber of Deputies before the war. "Really," said one Deputy, "there is only a small difference between men and women"—and as one man 500 Deputies arose and cried: "*Vive la différence.*"

NOTES AND COMMENTS

The Chemical Prospect

IN this interval between Christmas and the New Year we take the opportunity of wishing all our friends in the chemical and allied industries the compliments of the season. Our English readers, we trust, have already enjoyed their holiday, with a satisfactory share of such seasonable delicacies as may have been obtainable; to our Scottish friends we send our best wishes for many convivial occasions during their New Year break; and to all we offer confident hopes of continued prosperity, in happier circumstances, during 1945. The chemical industry has maintained a steady rate of development, under adverse conditions, throughout the war; and in some ways, as we have indicated in the Review of the Year in our recently-published CHEMICAL AGE YEAR BOOK, the last twelve months or so have seen really remarkable progress in many directions. Industrial chemistry is ever practical, and there has been little of the rather nebulous planning that has characterised certain other walks of life. On the other hand, firm foundations have been laid for getting on more rapidly with the normal business of life as soon as opportunity offers. Particularly is this so in the relations between the academic and the purely industrial sides of the profession. On all sides we have been hearing of university scholarships, and similar grants, which have been made available to the young men and women in whose hands lies the future development of our technological industries. We have still a hard stretch of road to traverse before we can enjoy the full fruits of our efforts during the war years; but the stage is set for an advance, and the chemist has a better chance than ever before of figuring among the leaders of the nation.

China Clay Exports

THERE has been a substantial increase in the export of china clay to the U.S.A. following the removal of the U.S. General Import Control Order on china clay in October. Since then regular weekly consignments have been shipped from Cornish ports, giving a much-needed fillip to the industry. Mr. Percy Harris, prospective Liberal Candidate for Penryn-Falmouth, and one of the leading personalities among the Controllers of the china clay industry on the producers' side, commented on the situation at the annual meeting of the St. Austell Liberal Association. He said it was heartening to observe Sir Stafford Cripps calling for more exports during the first years of peace. While the Minister of Aircraft Production mentioned ten of our chief pre-war exports, it was a pity he failed to include china clay and china stone, particularly as those Cornish products at one time were second only to coal among British export markets. Before the last war almost 70 per cent., representing over 600,000 tons, of china clay and china stone annually produced in Devon and Cornwall were exported. It was encouraging to know, he went on, that the Government was alert to the importance of china clay for both home and foreign consumption, and, anticipating an increased demand, the Board of Trade had just announced their decision to re-open

the china clay pits that were closed two years ago under the concentration scheme, as soon as labour became available. Mr. Harris further stressed the need for the speedy release of more china clay workers who had been sent to other parts of the country on work of national importance.

New Coal for Scotland

BEARING in mind the thesis that where there is coal there will be found a chemical industry, industrial chemists with a mind to expand their activities should be keeping an eye on Scotland. Just before Christmas was published the report of the Scottish Coalfields Committee, and, if their recommendations are to be carried out, the acreage of Scotland from which coal is won will be considerably extended. The key to the situation is the rapid fall in output from the old-established Lanarkshire coalfield, so that, if the pre-war Scottish annual average for coal is to be kept up, with the consequent retention of some 87,000 men in the industry, other sources of supply will have to be found. The committee reckons that, by expanding existing collieries and equipping new ones, an approximate annual increase of 9,000,000 tons can be achieved. Most of the proposed new sinkings are large affairs, designed in some instances to produce 750,000 tons per annum. In the coalfield extending from North-East Stirlingshire through Clackmannan into Fife, new sinkings are proposed at Larbert, Tullibody, Culross, and as far east as Dysart; in the Lothian field, there may be large new collieries near Dalkeith and Prestonpans; while in the Ayr and Dumfries area the principal sinking is to be at Killochan, near Maybole, with small collieries scattered over the area. Tullibody, by the way, was the birthplace of the Scottish geologist, Robert Dick, but the only mines in the district in his time were the decayed silver workings at Alva, in the hills to the north. The proposed new mines extend over a wide area, and all the sites are easily accessible. It would seem, if the schemes come to fruition, that there is an opportunity here for the establishment of a valuable series of by-prouct industries including a chemical industry.

Highland Water Power

SCOTLAND being in the news, it may be well to consider the recent remarks of Mr. A. E. MacColl, deputy-chairman of the North of Scotland Hydro-Electric Board, to a meeting of Press representatives in Edinburgh, as his words provide some indication of the prospects of a chemical industry for the far north. Distribution Scheme No. 1, which he dealt with, covers the area round Loch Alsh; the proposed power station, on the north bank of this sea-loch, will harness the power of the stream Allt Udalain. The present scheme is modest, serving the domestic needs of a community of some 1500 persons, but it is hoped to start work on the installation next spring, with the expectation that power may be on tap within two years. Power will be made available, Mr. MacColl said, wherever the demand arises, and supplies will be given to industry as near cost price as practicable, so as to attract manufacturers to the Highlands despite high transport costs. In this connection it may be pointed out that the nearest railway stations to the proposed power installation are at Kyle of Lochalsh and at Strome Ferry, each about seven miles away. However, it appears that a number of industrial inquiries have already been received. Among the inquirers are representatives of the electro-chemical and electro-metallurgical industries, and a company which is considering the erection of a fish-refrigeration plant. Meanwhile, at the Parliament House in Edinburgh, the objections to this, and to the Loch Sloy and Loch Morar schemes, are being heard this week.

U.S. FUEL SURVEY

To examine potential locations for synthetic fuel laboratories and demonstration plants, the U.S. Bureau of Mines will soon send engineering surveying parties into the field, stated Mr. H. L. Ickes. Under the Synthetic Liquid Fuels Act, these laboratories and plants will conduct a five-year programme of research and development to provide data for private commercial production of oil and gasoline and other petroleum products from the United States' immense reserves of coal, lignite, oil shales, and agricultural and forestry products. More than 150 proposals for sites have been submitted to the Bureau of Mines, representing nearly all the coal-producing States.

Coal Tar in Action*

I.—As a Source of Organic Chemicals

by D. D. MILNER

COAL tar was, until recently, the only indigenous source of hydrocarbons in this country, and for the last century chemical manufacturers have been relying upon this source for most of their organic chemicals with an aromatic structure. Since the time of Perkin's "Mauveine" chemists have continued to isolate more and more pure products from coal tar and place them at the disposal of the chemical industry. Complaints are made from time to time in the technical press that the coal-tar industry is backward and has not progressed at anything like the speed of the American petroleum industry. This was probably true in the past and the reason is obvious. Until recent years the distillation of coal tar was carried on by numbers of small distillers. There was keen competition among these distillers to obtain sufficient tar to keep their plants working 12 months in the year. These small plants with small throughputs could not afford to instal costly refining plant, as the source of tar was never assured. To-day, the distillation of tar is carried on mainly by large groups, and the quantity of tar is more or less assured. Because of this, large continuous tar stills have been and are being erected. More costly refining plants, many of a continuous type, are being used to deal with the intermediate stages of the tar-distillation process, and chemicals are being extracted from coal tar in these large plants that were almost unknown in the days of the batch tar still. Another disadvantage of the tar industry, as against the petroleum distillers, is the fact that coal tar varies considerably from source to source, coke ovens, horizontal retorts, and vertical retorts even in the same district.

The Composition of Coal Tar

The composition of coal tar varies considerably from different sources, but to illustrate my point I have chosen a typical analysis made some time ago by Weiss and Downs of a coke-oven tar. The percentages are given on a sample of dry tar.

COMPOSITION OF COKE-OVEN COAL TAR.

	per cent.
Crude benzol and toluol	0.3
Xylenes, cumenes and isomers	1.1
Indene, coumarone, etc.	0.6
Naphthalene	10.9
α-Methyl naphthalene	1.0
β Methyl naphthalene	1.5
Oils in the naphthalene and the methyl naphthalene range	1.7
Dimethyl naphthalenes	3.4
Acenaphthene	1.4
Oils in the acenaphthene range	1.0
Fluorene	1.6
Oils in the fluorene range	1.2
Anthracene	1.1
Phenanthrene	4.0
Carbazole and similar compounds	2.3
Oils in the above range	5.4
Phenol	0.7
Cresols and xylenols	1.5
Tar bases, pyridine, etc.	2.3
Pitch oils and greases	7.0
Pitch	50.0

Naphthalene

By far the largest single component in the list is naphthalene. This was partially extracted in the past for the production of naphthols, etc., for the colour industries, but most of the naphthalene in coal tar was used as fuel. This position is certain to be changed, as naphthalene will be in greater demand in its partially burnt form of phthalic anhydride for the manufacture of plastics, glyptals, etc., if the American chemical industry is any guide.

Of the other hydrocarbons, benzene and toluene have been used in industry, and although motor fuel has been a strong competitor, this may not be so after the war if tax adjustments are made, as both these hydrocarbons will be in more demand for synthetic processes, such as phenol from benzene. The amount of phenol in coal tar will not meet the demand for this material and synthetic phenol will be made, benzene being the obvious starting material. The xylenes and cumenes have only had limited uses in industry, except as solvents, but when these materials become available as pure products they will provide more raw materials for industry. *o*-Xylene is already available in limited quantity, and this quantity could, no doubt, be increased if the demand increased.

From the pre-war figures for the coal-tar industry, nearly 2 million tons of tar were produced in this country in 1938. If this figure is used in conjunction with the table, it will be seen that 0.1 per cent. represents 2000 tons or approximately 400,000 gallons. Thus, it will be seen that chemicals occurring in coal tar in only small percentages, if these can be extracted, will provide large amounts of chemicals for industry.

Of the higher hydrocarbons, anthracene is largely used in the dyeing industry, and has

* Papers presented to the Yorkshire section of the Institute of Fuel, at the Chemistry Lecture Theatre, Leeds University, on December 14.

been used for many years, while other less available hydrocarbons are now being put on the market, such as acenaphthene and fluorene. These substances are being used in industry for colour manufacture. Some other hydrocarbons occurring to a lesser degree in coal tar such as the methyl naphthalenes, are being asked for by the chemical industry, and the present limited demand may increase as normal conditions return. Mention should be made of one or two of the unsaturated hydrocarbons that are being used by the chemical industry. Perhaps the most usually important at present is indene. This hydrocarbon is not usually extracted as such, but is polymerised in the naphtha in which it occurs, and the polymerised indene resin is sold as such, mainly for use in the paint and varnish and the plastics industries. Some of the softer resins have been used as tackifiers for rubber, especially the synthetic variety.

Styrene

Mention of synthetic rubber brings me to another unsaturated hydrocarbon which is being synthesised and used in large quantities in the U.S.A. for the manufacture of Buna-S. This is styrene, it occurs in coal tar, but owing to the difficulty of extraction, it has not been heard of much in the coal-tar industry. With present methods of extraction, it is probably cheaper to synthesise it from benzene and ethylene, especially in the States where ethylene is available from the cracking plants. Dr. Coulson, of the D.S.I.R., has recently taken out a patent for the recovery of this material from crude solvent naphtha by an azeotropic method using ethylene glycol monomethyl ether as the azeotropic liquid. Styrene is in demand by the chemical industry as its polymers have valuable electrical properties.

Dicyclopentadiene is another unsaturated hydrocarbon extracted from coal tar which is now available to the chemical industry, and the material is at present being examined from many sides, such as paint, rubber, etc. It has also been examined as a source of cyclopentadiene, which has been shown in America to be an excellent anti-knock agent in motor fuel. This material is easily made from dicyclopentadiene by depolymerisation to the monomer, and final hydrogenation.

In that résumé of the hydrocarbons available to the chemical industry the whole story has not been told, but sufficient to hint that in the future less and less of the coal-tar hydrocarbons will be available for fuel. For the present, chemical industry will pick out those substances it requires and the remainder will be available for fuel purposes. If at some future date catalysts are discovered which will break down the more complex aromatics to simpler ones, a process widely used with the paraffinic hydrocarbons, the story will have quite a different ending.

I should like now to turn to products which it is quite safe to assume no member of this society would desire to use as fuels —*i.e.*, coal-tar phenols and coal-tar bases. Perhaps a good reason for this healthy desire is the price of these materials, 3s. to 4s. per gal. for phenols, and a good deal more for the bases. Although these products occur only to the extent of a few per cent. in coal tar, on the previous calculation the total available is probably over 100,000 tons per annum of phenols, and probably over 40,000 tons per annum of bases. If these figures are taken into account along with the price standard it will be seen that these products are a most valuable part of coal tar.

Phenol

Originally, phenol was extracted from coal tar to be used as a disinfectant or antiseptic, but to-day very little is used for this purpose—certainly in war time. Better and less toxic materials are available, most of them from coal tar. During the last war, the chief demand was for picric acid as a high explosive, and large synthetic phenol plants were used to manufacture phenol from benzene. In this war, very little phenol is used for the manufacture of explosives, and its chief use is for the manufacture of thermoplastic materials in conjunction with formaldehyde or other aldehydes. Phenol is still considered the best material from which to make bakelite. It is certain that in the future the phenol production from coal tar will not be sufficient to meet the demand, and synthetic phenol will have to be made from benzene. Phenol is also hydrogenated to produce cyclohexanol and cyclohexanone. These are used as the starting materials for the manufacture of adipic acid which is one of the components of the new plastic nylon. They are also in demand as solvents.

Cresols

Ortho-cresol, the lowest boiling isomer, is not favoured by the plastic manufacturers, to judge from the latest specifications. The reason is rather obscure, but it appears that the final reaction in the hot-pressing stage is rather slow. It is used, however, in the manufacture of tricresyl phosphate, a valuable plasticiser, and a certain amount is being used to make dinitro-*ortho*-cresol, used as an insecticide. *Ortho*-cresol, or cresol mixtures rich in *ortho*-cresol, were used at one time as inhibitors in motor spirit, but better materials have now been found to replace these.

Meta- and *para*-cresol boil at about the same temperature, and have only been separated commercially by chemical

methods. The mixture, however, is used as such for a variety of plastics and for some purposes is preferred to pure phenol. The *meta*-isomer predominates, and this material reacts very quickly in the formaldehyde process, so that the presence of the *para*-cresol helps to tone down the speed of reaction.

The cresols are widely used in the manufacture of lysol type disinfectants, all three isomers being useful for this purpose. The pre-war carbolic soap was also responsible for the use of large quantities of cresol, but in war-time the cheaper xylenols have been substituted.

Xylenols

Mixtures of these dimethyl phenols are largely used as disinfectants, as they are not so caustic as the cresols and are probably quite as good for disinfectant purposes. The mixed xylenols are also used in the manufacture of oil-soluble resins. Of the pure xylenols extracted from coal tar, the most important is the 1.3.5 isomer. This material is the most reactive of the phenols in the formaldehyde reaction and usually has to be diluted before being processed. It is also in demand for the manufacture of *para*-chloro *meta*-xylenol, the active principle in antiseptics of the Dettol type. Another xylenol that has had a limited demand is the *ortho*-4-xylenol. This has been used as the starting material for the manufacture of riboflavin (vitamin B2). For the other xylenols, so far, the chemical industry has not made many demands, but an interesting point is that the *meta*-4-xylenol is used for the quantitative identification of nitrates.

The higher boiling tar-phenols are largely used for the manufacture of disinfectant fluids of the Izal type, sheep dips, etc. The phenols generally are good solvents and are used in some industries for this purpose.

Coal-Tar Bases

Twenty-five years ago, the main use for tar bases was as a denaturing agent for alcohol. Two grades were used, based on two German specifications, the O.G.S. 90/140° and the N.G.S. 90/160°. The figures refer to the distillation range of the material. Any residues left from the above materials were usually dumped into creosote. The demand for pure pyridine changed all this.

Pure pyridine is used in some textile treatments, and in certain processes of rayon manufacture. There is also a demand for the manufacture of the new sulphapyridine drugs. A certain quantity is also hydrogenated to piperidine which is used in the manufacture of rubber accelerators. It is a very powerful solvent, but its strong odour rather limits its use.

With the demand for pure pyridine the methyl pyridines were investigated by the coal-tar industry and quite recently the picolines have been made available to the chemical industry. The separation of the picolines was encouraged by the demand for 3-picoline as the starting point for the manufacture of nicotinic acid, one of the B-class vitamins. This material was first separated on a commercial scale in this country in Yorkshire, and most of the present make, after suitable oxidation, finds its way into our daily bread. The 2-picoline and 4-picoline are also available to industry, although their uses have hardly had the necessary time for development.

The lutidines, dimethyl pyridines, are used chiefly as special solvents, being largely used in the mixed state in the purification of crude anthracene. The higher-boiling collidines are also used for this purpose. The tertiary pyridine bases are also used in certain organic reactions for the removal of hydrochloric acid from an organic molecule.

Among the higher-boiling tar bases are found the primary aromatic amines, aniline, the toluidines, and the xylidines. Some of these can be extracted in a pure state, and their uses in industry are obvious. In the case of the toluidines, it is interesting to note that when prepared from toluene by nitration and reduction the *meta*-isomer is only present in small quantity, whereas in the toluidines extracted from coal tar the *meta*-isomer predominates.

One of the higher-boiling substances allied to the bases is carbazole. This substance has been used to a small extent as an intermediate for dyetuffs, but the demand is so far only slight.

Sulphur Compounds

Sulphur compounds, including hydrogen sulphide, are present in coal tar to an appreciable extent. They usually occur as impurities, very difficult to remove, in the otherwise pure products from coal tar, *e.g.*, thiophen in benzene. Usually, the tar distiller is only concerned with their removal or destruction, and very few have been extracted for commercial purposes. Carbon bisulphide is one exception; this substance occurs in crude benzol and is largely extracted in this country by means of the ammonium polysulphide process, a patent held by Yorkshire Tar Distillers. The material, which can be extracted chemically pure, is mainly used as a solvent and in the manufacture of carbon tetrachloride. It also forms the basis of several rubber accelerators.

Finally, one inorganic chemical element, mercury, is recovered from coal tar. This was first reported, I think, by W. Kirby, and is another product which only made its appearance when continuous tar stills were put into operation, as the actual percentage in tar is very small.

II—Notes on the Coal-Tar Fuels

by E. BRETT DAVIES

THE previous speaker has indicated some of the great variety of substances which are obtained from coal tar. Most of these substances are only a small proportion of the original raw material, and some 70 to 80 per cent. of the products of the distillation of crude tar are pitch, together with creosote and other tar oils. There are many industrial uses for this large bulk of material, either collectively as refined tars or similar substances, or individually as pitch and oils, and it is towards the use of these products for fuel purposes that our attention is now directed.

In passing, two indirect fuel derivatives from coal tar may be noted. The first, a very high-grade "motor spirit" for internal combustion engines, is made by hydrogenating creosote. The second, pitch coke, is made by the carbonisation of medium soft pitch in specially designed stills or ovens. Pitch coke may be regarded as the ultimate residuum from the total destructive distillation of crude tar. It consists largely of carbon, and is produced in comparatively small quantities in this country for the manufacture of carbon electrodes.

Hard Pitch

Hard pitch is the first commonly used coal-tar fuel to be considered. This fuel is made by continuing the tar distillation beyond the point at which normal medium soft pitch is produced. An additional 15 per cent. to 20 per cent. of oil is separated as the softening point of the pitch increases from 70°C. to 100°C.* or more. This latter figure, as a general rule, may be regarded as a minimum for hard pitch fuel for pulverising purposes. This fuel normally contains less than 1 per cent. of ash, less than 1 per cent. of sulphur, and has a calorific value of approximately 16,000 B.Th.U. per lb. It has no inherent moisture content, and neither does it deteriorate in stock nor is it liable to spontaneous combustion. Hard pitch may be transported and handled with the same facility as other solid fuels, but because it is liable to soften at temperatures approaching 100°C., the methods of applying the fuel call for special precautions. When correctly applied it is found to be an ideal powdered fuel, and when compared with other pulverised fuel practice, one of the outstanding features is the lack of wear on mills and other handling plant.

The most commonly used coal-tar fuels are those which are applied in liquid form. These fuels range from medium soft pitch, which is normally solid at atmospheric temperatures and has a softening point of 70°C., to light creosote oil which is liquid in normal circumstances. This range covers intermediate products such as the well-known "creosote/pitch mixture." This name is perhaps rather an unfortunate choice, since it conveys the impression that this and other similar fuels are actually compounded from proportions of the named constituents. Moreover, while only one general grade of creosote/pitch mixture is at present in common use, there are other grades, and the name gives no indication of the composition or viscosity of the fuel. These fuels are all perfectly homogeneous products produced to strict viscosity specifications, and while they naturally contain varying proportions of creosote and pitch, they are not normally made by mixing together these two elementary constituents, but are generally prepared either by distilling the lighter fractions from the crude tar until the fuel, which remains in the still, has the required viscosity, or by taking a fairly viscous tar base and adding oil to it to produce the correct viscosity fuel.

The Naming of Fuels

In its recent publication, *Coal-Tar Fuels*, the Association of Tar Distillers has published specifications for a complete range of coal-tar fuels and has introduced a new system of nomenclature based upon viscosity. It is generally accepted that for ordinary purposes a viscosity equivalent to 100 seconds Redwood No. 1 is desirable at the point of atomisation of a liquid fuel. By incorporating the temperature at which the fuel attains this viscosity into the name of each fuel a simple and distinctive grading is produced. Thus light creosote, which is liquid and may be atomised at atmospheric temperature, is called "Coal-Tar Fuel 50," while medium soft pitch for liquid fuel purposes becomes "Coal-Tar Fuel 400," since it is at 400°F. that its viscosity is approximately 100 Redwood No. 1. Tabulating the whole range of coal-tar fuels:—

TABLE I

C.T.F. 50	A light oil similar to grade "A" creosote.
C.T.F. 100	A creosote oil similar to grade "B" creosote.
C.T.F. 200	The tar fuel now commonly known as C/P mixture.
C.T.F. 250 C.T.F. 300	These are two heavier grades of tar fuel particularly suitable for heavy metallurgical purposes.
C.T.F. 400	A standardised grade of medium soft pitch fuel.

As might be expected, the calorific values of these fuels range from the maximum value for the true oils containing the highest hydrogen content, down to C.T.F. 400

* The softening-point temperatures are those determined by the method of Kraemer and Sarnow. It should be noted that the softening point is only an indication and not an absolute measure of grindability.

which shows the lowest hydrogen content. Differences, however, are not very great, as may be seen from the following tabulation from which the properties of the intermediate fuels may be interpolated*:

TABLE II
TYPICAL ULTIMATE ANALYSES PERCENTAGES

	C.T.F. 100	C.T.F. 400
Ash	Trace	0.13
Carbon	89.30	90.42
Hydrogen	6.90	5.23
Sulphur	0.13	0.65
Nitrogen	0.84	1.38
Oxygen (by difference)	2.83	2.19
Calorific value ...	17,050 B.Th.U.	16,240 B.Th.U./lb.

C.T.F. 400 may be transported and stocked as a solid fuel and subsequently melted and heated up before use. In common with the other fuels, it may also be transported from producer to consumer as a liquid. The transport and subsequent handling of all the coal-tar fuels, and their atomisation, are entirely analogous in method to other liquid-fuel practice. Due regard must be given to the viscosity characteristics of the fuel in use, and at the same time care must be exercised to avoid the possibilities of sedimentation and/or gassing if the fuels are overheated.

Viscosity Limit

For general purposes, 5000 seconds Redwood No. 1 is usually accepted as the viscosity limit at which a liquid fuel may be handled by consumers' pumps, and, except for special applications, 100 seconds Redwood No. 1 may be taken as a convenient viscosity for atomisation by standard types of fuel burner. These two criteria fall within the ranges given in the following table, although the figures therein should only be used as a guide, and in specific instances special provision may have to be made for atomisation or handling to be performed outside the ranges indicated.

TABLE III

	A Transport and pumping temperature, °F.	B Atomisation temperature, °F.
C.T.F. 50	Atmospheric	Atmospheric
C.T.F. 100	80 to 120	100 to 120
C.T.F. 200	80 to 100	180 to 200
C.T.F. 250	130 to 160	240 to 260
C.T.F. 300	170 to 200	280 to 310
C.T.F. 400	270 to 310	370 to 400

Because it is difficult, and in many cases practically impossible, accurately to control the temperature, and consequently the viscosity, of small feeds of the more viscous fuels, it has been found possible in practice to make a rough classification of the types of fuel suitable for burners of various capacities. There are no definite limits in this connection, as much depends on the degree of elaboration of each particular plant, but the following table may be useful as a general guide:

TABLE IV

C.T.F. 400 ...	Suitable for burners of not less than 10 G.P.H.
C.T.F. 300 ...	Suitable for burners of not less than 5 G.P.H.
C.T.F. 250, C.T.F. 200, C.T.F. 100, C.T.F. 50	Suitable for burners of not less than 1 G.P.H.
	Suitable for fractional G.P.H. burners.

Again, depending upon the viscosity/temperature characteristic, certain types of burner have not been found suitable for the more viscous fuels. Thus for C.T.F. 50 to 250 inclusive practically all types of burner may be employed, but for C.T.F. 300 and 400 only pre-heated high-pressure air or steam atomisers have been successfully applied. It has been claimed that these latter two fuels may also be atomised with mechanical atomisers, but much more experience is necessary before this procedure can be safely recommended.

Suitable Installation

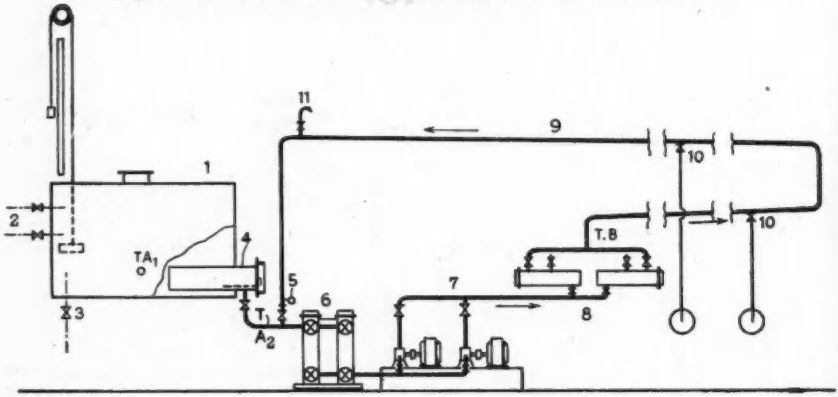
It is beyond the scope of this short paper to discuss in detail the methods of application of the various C.T. fuels. The drawing which follows shows a type of installation which is suitable for any of the fuels. The notes on the drawing indicate the special features of a coal-tar fuel lay-out and at the same time show the modifications necessary from fuel to fuel. This type of plant is that particularly favoured by the writer. There are, naturally, other methods of applying the various fuels, and there are also individual works idiosyncrasies which obviously cannot be incorporated into a general diagram (*see* Fig. 1, p. 608).

It is hoped that with the return of peacetime conditions there will be grades of coal-tar fuel available, suitable for most industrial liquid fuel applications. Attention is drawn to the fact that the more viscous grades of coal-tar fuel—from C.T.F. 200 upwards—burn with an intensely luminous flame which is particularly valuable for metallurgical purposes.

In conclusion, the writer would deplore that opinions have on several occasions appeared in the technical Press, suggesting that the coal tar fuels are inherently dirty in operation, that lighting up is difficult, and smoke and sparks inevitable. When correctly applied these fuels should be just as clean in operation, and combustion should be as complete, as with any other liquid fuel. Such troubles should not be assumed to be the inevitable concomitant of the use of a coal-tar fuel; they are due either to faulty plant or inefficient operation and can and should be corrected.

* These figures are taken from *Coal-Tar Fuels*, by J. S. Sach, Association of Tar Distillers, 166 Piccadilly, London, W.1.

Fig. 1. Installation suitable for the application of coal-tar fuels.



1.—Fuel storage tank, lagged and fitted with depth indicator.

2.—Cocks for skimming aqueous superficial layer (fuels 50 to 250 only).

3.—Tank drain-cock.

4.—Shrouded tank-heater, position of thermostat shown dotted above outlet cock. The temperature of the storage tank as shown by thermometer "T.A.1" should approximate to the lower figures in column "A," Table III.

The temperature of the fuel leaving the storage tank should approximate to the higher figures in column "A," Table III. This is shown on "T.A.2."

5.—Ring main pressure gauge and spring-loaded pressure control valve. Apart from pressure jet applications, it is normally advantageous to operate at low pressures, *i.e.*, 5 to 15 lb./sq. in.

6.—Strainer in duplicate. Filter medium to be perforated plate or mesh not of brass or similar alloys. Fine mesh may be used for fuels 50 and 100, ☆ in. apertures for other fuels. Filters to be steam-jacketed for fuels 300 and 400.

7.—Fuel circulating pumps in duplicate. These to be reversible. Reciprocating pumps may also be used in conjunction with stroke damping device. Steam-jacketed pumps necessary for fuels 300 and 400. Pumps should be in a warm and not an exposed place.

8.—Flow heater with stand-by duplicate to bring fuel to atomising temperature "B," Table III. This heater not necessary for fuel 50. Steam or electrically operated, thermostatically controlled. Temperature indicated by thermometer "T.B." Heaters vented.

9.—Ring main circulating fuel at 2 to 4 ft./sec. Graded to rise to high point 11. For fuels 100, 200 and 250 ring main should be lagged with inclusion of heating cable or steam tracer line. For fuels 300 and 400 ring main should be steam-jacketed.

10.—Off-takes to burners made via "T" type valves. A steam "blow through" connection is advantageous on the burner side of these valves particularly for fuels 300 and 400.

11.—Ring main high point fitted with vent cock.

Note.—When closing down, ring main should be drained by reversing pump, closing (5) and opening vent cock (11). Balance of fuel remaining may thereafter be drained from strainer drain cock. It is particularly important with more viscous fuels to ensure that heaters (8) are completely drained before switching off.

For C.T.F. 50 to 250 inclusive, plain valves or cocks may be used throughout the system. For C.T.F. 300 and 400, these should be steam-jacketed.

Chemistry and Clothing

First Dalton Lecture

IN honour of the centenary of John Dalton, the Manchester and District Section of the Royal Institute of Chemistry established an annual Dalton lecture on subjects connected with the application of chemistry to everyday life. The first lecture has been given by Dr. D. Clibbens, of the British Cotton Industry Research Association, who spoke on "Chemistry and Clothing." The lecturer said that the lag between laboratory discovery and technical exploitation appeared to be diminishing in geometrical progression. About sixty years elapsed between Mercer's discovery and the technical production of mercerised cotton textiles; about thirty years between the discovery of viscose and a fully developed viscose rayon industry; while nylon was in commercial production within fifteen years of the initiation of Carothers's research which led to its discovery. Dr. Clibbens concluded his lecture by saying that the organised chemical knowledge by means of which we were enabled to mould our environment according to a premeditated plan was at last beginning to embrace our very closest environment—the dress with which we clothed ourselves—and in the near future the art of clothing might reflect, as never before, our achievements in the science of chemistry.

Industrial Alcohol from Crops

A Chemical Outlet for British Agriculture

DURING the war, British agricultural industry has received considerable impetus from the necessity of obtaining a maximum amount of foodstuffs from the limited area of land available. With the cessation of hostilities, however, when abundant shipping will once more be available for the carriage of foodstuffs, the increased acreage of land that has been devoted to food production may be allowed to revert to its former condition, in the absence of continued Government help to the farmer. It is already recognised in some quarters that the growing of crops for alcohol production is an attractive proposition, and this outlet for the farmer's produce is independent of any subsidy or other extraneous financial assistance. Before the war much research work was carried out on alcohol as a motor fuel, and alcohol-petrol mixtures, giving many advantages to the internal combustion engine, were on the British market for several years before 1939. In view of the war-time advances in the making of synthetic resin varnishes, using alcohol as a solvent for the resin, the future demand for industrial alcohol will certainly be much greater than ever. A great advantage of alcohol as a motor fuel is that it can be produced in any desired quantity, from home-grown material, the supply of which, unlike petrol, is inexhaustible. In some countries, with the object of assisting the agricultural industry, regulations are in force requiring petrol to be admixed with alcohol in definite proportions for use as motor fuel.

In this country a large proportion of the alcohol produced has been made from molasses, the supply of which material is, of course, limited by the amount of sugar refined; and as the cane-sugar refining industry regulates its output, in normal times, according to the demand for sugar—and not for the by-product molasses—this industry could not meet a greatly increased demand for molasses from which to produce alcohol. So that the main alternative is the utilisation of crops from which to manufacture the additional alcohol required. Cost must, naturally, be the first consideration in determining the suitability of a particular crop for alcohol production, and two chief factors control the cost: (1) yield per acre; and (2) proportion of useful material in the crop.

Alcohol from Cereals

The chief cereal crops that could be made available, in suitable climate and soil, for distillery purposes are maize, barley, rye, and oats, and these cereals have for many years contributed to the raw material used both in potable and in industrial alcohol manufacture. From 65 to 70 per cent. of fermentable material is present in maize. With an average yield of one ton of the grain per acre, 85 gallons of 95 per cent. alcohol is obtainable therefrom. Maize has an advantage over other cereal crops in that it does not readily deteriorate, for distillation purposes, over long periods. The stalks of maize may also be regarded as a profitable source of alcohol, the highest yield of alcohol being obtained by removing the ears of corn at a slightly earlier stage than normally. Barley contains up to 65 per cent. of fermentable matter, and produces approximately 75 gallons of 95 per cent. alcohol per ton of grain. An acre of land yields from 18 to 20 cwt. of barley. Rye is generally a more hardy crop than barley, and is specially adapted for cultivation in colder regions. Its yield of alcohol per ton of grain is about the same as barley, but the amount of rye yielded per acre is much less than is the case with barley, averaging just over 10 cwt. per acre. An advantage of rye crops is that they do not drain the soil of its nutriment so rapidly as do the other cereals, and a crop of rye may be grown on the same patch of land for several years in succession without impairing the quality or yield of the crop. Oats is a crop suited to many soils, although it is not so robust as rye. Up to 70 gallons of 95 per cent. alcohol is obtainable from one ton of oats, and the yield of grain per acre averages about 17 cwt.

Root Crops

Potable alcohol will probably always be produced from grain, owing to the characteristic flavour required in such spirits, which flavour is derived from the grain. Nevertheless, root crops are the more promising as a raw material for the distiller of industrial alcohol. Although root crops contain much less fermentable matter than do cereals, the yield per acre is in their favour. Potatoes, although containing little more than 20 per cent. of starch, yield about five tons per acre, and 25 gallons of 95 per cent. alcohol per ton, or 125 gallons per acre, which is a big increase on the amount obtainable from any of the grain crops. Sweet potatoes yield a slightly higher percentage of alcohol than potatoes. The possibility of sugar beet for alcohol production has also to be considered. Its cultivation for sugar-making is now a well-established practice in this country, but to grow the crop entirely for distillery purposes would be something of an innovation. The

by-product, beet molasses, has always been taken by distillers and the final residue disposed of for cattle feeding. Beet contains 17 to 18 per cent. of sugar capable of being converted to alcohol, and the yield of the root per acre varies in different countries from 10 to 16 tons. Beets generally do best in loamy soils; a soil too heavy or too stony prevents the roots from spreading and induces stunted growth, with consequent loss of weight in the roots. Mangolds are another potential source of alcohol, and these roots thrive on almost any type of soil. The sugar content is comparatively low, being about 6 per cent.; but to counterbalance this the yield of the roots per acre is relatively high, averaging about 20 tons, or about 135 gallons of 95 per cent. alcohol per acre. When used by the distillery, mangolds produce more residue than beet, but, as in the case of the latter, the by-product is readily taken by cattle. The residue is about a quarter of the whole root with beet, and about one-third with mangolds.

It will thus be seen that the root crops offer the greatest possibilities as potential sources of industrial alcohol. They not only produce far more alcohol per acre than do cereals, but the by-products are more valuable, and generally more acceptable, for the feeding of stock. It was estimated in 1939 that industrial alcohol of 95 per cent. strength could be produced at a price of from 8d. to 9d. per gallon, thus comparing favourably with the pre-war price of other motor fuels. It will be seen, therefore, that the local production of alcohol from agricultural crops is not an unremunerative proposition.

Dehydrating Alcohol

Hitherto a disadvantage of alcohol, when used as a motor fuel, and also in some classes of varnish manufacture, has been the presence of the residual moisture in the spirit, as this water cannot readily be got rid of by distillation or rectification. It is interesting to note that this drawback has been practically overcome by intensive research work during the war years, resulting in the introduction of new methods of dehydration. For example, B.P. 534,374 (February 12, 1940) states that after treatment of the rectified spirit with a dehydrating agent, for example, glycerine or glycols, which may be used in conjunction with hygroscopic salts, and the removal of the absolute alcohol, the residual mixture of the dehydrating agent, alcohol, and water, is heated at atmospheric pressure in thin films, as a spray, or in tubular heaters, at a temperature of 110-120° C. The dehydrating agent is thus recovered in one operation and the separated mixture of alcohol and water is returned to the rectifying plant for re-treatment. Another method of dehydration is described in B.P. 538,102 (February 16, 1940); here, after removal of heads, followed by rectification, further dehydration is secured by bringing the liquor with 50-60 per cent. of alcohol in contact with a saturated aqueous solution of a dehydrating substance, such as potassium carbonate. The dehydrating solution is continuously withdrawn, then concentrated, and returned at a controlled rate of flow to maintain the necessary concentration.

Petrol in Dehydration

According to N. Srinivasan (*Current Sci.*, 1941, *10*, 204) mixtures of alcohol, water and a petroleum fraction are fractionally distilled, and the ternary mixture, or the turbid portion of the distillate, removed first. When diluted with an equal volume of water and salted out, the petrol separates. The alcohol content is determined hydrometically in the aqueous layer and the water content found by difference, thus giving a measure of the efficiency of petrol as a water entrainer. In practice the ternary mixture separates into two layers. The upper layer, comprising 56 to 57 per cent. of the whole, contains about 89 per cent. petrol, 10.5 per cent. alcohol, and 0.5 per cent. water, and is returned to the still, while the lower layer, comprising 43 to 44 per cent., is distilled to recover the alcohol.

When benzene is substituted for petrol as an entrainer, the lower layer constitutes 13 to 15 per cent. of the distillate, benzene being a more efficient entrainer of water than is petrol. In the U.S.A. methylene dichloride is employed for dehydrating alcohol, since it forms an azeotropic mixture with water, but is inert to alcohol itself; the mixture contains about 1.8 per cent. water and has a boiling point of about 38°C.

New Control Orders

Wax Polishes

CONTROL of the supply, marking and packing of polishes made wholly or partly of wax ceases after December 31, when the current Limitation of Supplies (Polishes) Order expires. Separate directions will be issued calling for returns of supplies made in the period ending December 31.

The Board of Trade is confident that, while in the interests of leather preservation manufacturers will continue to produce an adequate amount of boot and shoe polishes for supply on the home market, they will do their utmost to expand exports. Copies of the Order ending the control (S.R. & O. 1944, No. 1413) will shortly be available.

International Patent Office

Further Discussion of Possibilities

THE CHEMICAL AGE, in a recent comment (July 15, p. 49), voiced its opinion on the subject of an International Patent Office, the formation of which had been suggested in an article in the *Central European Observer*. As readers interested in this vital yet rather neglected problem will recall, the author of the article, Mr. S. Mittler, in a letter to the Editor, added some further clarifying remarks (October 28, p. 414). In order to promote a wider discussion, we think it opportune to call the attention of our readers to what Mr. Peter J. Gaylor, an American author, has to say on this subject in a paper entitled "Possibilities in Post-War World Patent Law Unification," presented on May 17 to the Practising Law Institute, New York City (reprinted in *J. Pat. Office Soc.*, 1944, *24*, 8, pp. 536-541).

Considering the proposal of forming an international office for registering patents somewhat along the lines of the International Copyright Convention of 1886, whereby applicants are given certain rights in member countries, the author maintains that the convention of 1883 was the first real step toward a mutual understanding on patents from an international point of view. Unfortunately, it only gave the applicant the benefit of the domestic filing date for a specified period of time.

It might be asked what advantages there would be in an international patent office. In addition to the encouragement of domestic industrial development and the stimulation of world trade, convenience, thrift, and elimination of waste of materials and labour would accrue.

Master Patents

A few years ago, the Inter-American Bar Association suggested the possibility of establishing a unified patent system whereby the search is made by a single patent office among the American nations, authorised to issue a *master patent* which, upon suitable translation, may be registered in a member country for a nominal fee. It pointed out that more revenue might be gained from the volume of registrations, since no examination there would be necessary. An Inter-American Court of Patent Appeals was also proposed.

Although these suggestions have their merits from the long-range point of view, it is felt that a sudden change would be very difficult to introduce. A more logical approach might consist of first instituting a campaign of unification of the various national laws, followed by some international system which would still make use of the existing domestic laws and machinery. One such proposal is outlined in the accompanying chart (p. 612)

According to this plan, the filing of an application in the domestic country would be a prerequisite, as in the case of copyrights. This can then be followed by registration of the application in the international office. The patent finally granted to the inventor in his domestic country should likewise be required to be filed with the international office. The latter need not carry out any search; it would merely give the applicant the right to apply for a permit to commercialise and contest his international patent in any of the member countries, subject to the patent laws of those countries. In case of an interference between a domestic and an international patent, the contest can be determined by the domestic tribunal. Also, an international patentee might be required to give notice in the official publication of a domestic country when he is about to practice or transfer his rights in that country. This would enable a domestic patentee to contest his right to do so.

The Sequence of Operations

Reading from top to bottom in the appended chart, the applicant first files in his domestic country, and thereafter has a convention period within which to file in the international office. The domestic application is thus registered, giving the inventor the benefit of the filing date in his own country. After prosecution, the domestic patent issues, and a period is specified within which the applicant must register his patent in the international office. This step gives the patentee the right to assert his invention in any of the member countries. The international office follows with a notice of this registration in its own publication, so as to enable anyone in the member countries to obtain copies of the domestic patent. In the meantime an opposition period may be given in the domestic country, also allowing residents of foreign member countries to file an opposition if international registration has been secured. But the latter should be estopped from subsequently opposing the same patent in their own country on the same grounds.

An international patentee can indicate his intention to work his invention in a foreign country by a notice in the patent office publication of that country. Thereafter, an opposition period could be declared by the foreign patent office to enable native inventors, patentees, and others to assert

their rights or objections. If the international patent survives this ordeal, the foreign patent office grants the right to work the invention there, and the patent is treated as though it were a domestic patent. An international commission could be made available to work on elimination of inequities in various member countries, and to make certain that the international provisions were being followed.

Also, the member country has not lost anything which it had before the patent was granted. Taxes and re-issue fees could also be imposed, if desired, as in the case of domestic patents.

The granting of a patent in a country does not necessarily mean that a foreign patentee will be able to realise anything on his invention even though it is practised to a major degree in that country. For example, a Japanese journal[1] reported during 1938 that serious apprehension was being felt in certain circles regarding the patent situation in Japan. Many aliens saw no advantage in obtaining Japanese patents when industrial activities were shrouded in so much secrecy. It took a German aircraft company ten years to discover that its patented wing construction had been adopted by a Japanese manufacturer without the formality of a licence contract. A Swedish machinery firm discovered the infraction of one of its important patents

OPERATION OF INTERNATIONAL PATENT SYSTEM

Domestic Country	*International Office*	*Foreign Country*
File Application		
Period for international filing of application	Registration of application	
Prosecution		
Patent Issues		
Period for filing patent in international office	Registration of patent	
Opposition period	Publication or Notice	
Duration of domestic patent	Notice of intent to practice invention	File notice in patent office publication
		Opposition period
		Patent office grants right to practice
		Duration of foreign patent

One objection to the scheme might be that an international group could restrict industrial development within a country by taking out international patents and then manufacturing only within a selected country. An argument against this contention is that the member country can apply its working and compulsory licensing provisions, if it so desires, although the latter step could not at present be invoked in the U.S. Furthermore, there is nothing to prevent such a group from taking out foreign patents under the existing system.

only because the Japanese firm made the blunder of publishing the design in a catalogue. In a chemical process, it is still more difficult to prove infringement, particularly when a mobilisation law is in effect placing severe punishment on revelation of secret information. The same has been true in the case of Russia; it is, however, hoped that conditions will improve in these respects after the war and that an "open door" policy will be adopted. This also applies to China, whose present patent law protects only native inventors.

Concluding, the author refers to a British commentator,[2] who some eight years ago, wrote as follows:

> Eventually, perhaps, there may be an international Patent Office perhaps using a special language of technical symbols and working by wireless; inventors everywhere will be catered for; there will be no struggle over a multiplicity of word pictures for the outcome of an earnest soul's direction of his fingers and his wits. Inventions will be given three years' probation and the inventor will then have a monopoly for 15 years or so, or will perhaps be given other privileges based on satisfied public demand. But that time is not yet.

It may be that the time has now come, suggests Mr. Gaylor, to study ways and means of unifying the various patent systems and to have an unbiassed group make recommendations for the benefit of all. As a result of advances in aviation and communication, we all now realise that the world has become much smaller, and that widely separated countries can now be considered in the same light as neighbour States have been considered in the past.

There is no doubt that the patent system is one of the most potent factors in the scientific development of a nation. Therefore, by unifying the numerous national laws and providing international registration, it would be possible greatly to speed up industrial advancement throughout the world, and make use of valuable raw materials regardless of where they may be found.

REFERENCES

1 LEOPOLD, *Ind. Eng. Chem. News Ed.*, Oct. 10, 1938, p. 531.
2 SILVESTER, *Chem. & Ind.*, 1936, *13*, p. 909.

The demand for a Central Bureau of Standards for India, with a view to co-ordinating the various existing systems of specification, is voiced in the October issue of *Science and Culture* (p. 137). An expansion of the functions of the Government Test House at Alipore is suggested, preferably with the concurrent establishment of the proposed National Physical Laboratory on an adjacent site.

Scientific Literature

The Needs of Liberated Europe

AN appeal is being made to British scientists over the signatures of W. H. Beveridge, P. M. S. Blackett, E. Carter, J. G. Crowther, C. D. Darlington, and R. A. Gregory, to supply scientists in liberated Europe with literature dealing with advances made in allied countries during the war. In particular, French scientists need this material as quickly as possible. In Paris, there is gas and electricity for only one or two hours in the evenings, so that experimental work is hardly possible.

The appeal runs, "To help these scientists, who have played an active part in the Resistance Movement, to use their time profitably until they can restart their laboratories, and as a gesture of friendship, we should like to send them copies of scientific journals published during the war. All material sent to France would be fully used. Literature would go to the Centre National de Recherche Scientifique in Paris, which is in touch with the whole body of French scientific workers. Single copies would be microfilmed, and films and abstracts distributed. Thus the greatest possible use could be made immediately of any periodicals that can be sent to them. We are, therefore, appealing to British scientists to give to their French colleagues copies of scientific journals, technical papers, reprints, etc., from January, 1940, onwards. We hope that there will be a generous response to this appeal." Papers should be sent to: The Association of Scientific Workers, 73 High Holborn, London, W.C.1.

U.S. CHEMICAL SUIT

In the New York Federal Court, Judge Knox refused interference with the possession of the Alien Property Custodian of securities and patents valued at $35,000,000, handed over under protest last June by the Standard Oil Company of New Jersey and affiliated companies. He held that, while the court can protect the integrity of property wrongfully taken from a lawful owner, it had not been shown that the custodian was doing or about to do anything in violation of plaintiffs' rights.

The securities are 20 per cent. of the outstanding stock of the Standard Catalytic Company, 50 per cent. of that of Jasco, Inc., and 25 per cent. of that of Hydrocarbon Synthesis Corporation. The patents, some 675 in number, cover processes for refining crude oil and making synthetic rubber and were acquired in 1929 in a transaction with I. G. Farben, which was allowed $35,000,000 in securities of the three companies.

Part-Time Education

Cash Awards for Successful Students

SUCCESSES in the examinations of the Royal Institute of Chemistry and the Institute of Physics are included among those for which cash awards are announced by the Dunlop Rubber Company, as part of their new Part-Time Education Scheme. In each case Fellowship is rewarded with a payment of £20, and Associateship with £15. Those who receive the Board of Education's Higher National Certificate for chemistry will be paid £15; the National Certificate £10. Those working for a university degree receive £5 on matriculation, £15 on passing the Intermediate, and £25 on passing the Final Examination. Exceptionally meritorious achievements, such as a good honours degree, may receive a special merit award.

These awards are among the inducements which the Dunlop company is offering in accordance with its general policy of encouraging those of its employees who wish to improve their education by part-time study. Moreover, subject to the receipt, from the appropriate education authority, of a satisfactory report on attendance and work, the company will refund all or part of the tuition fees.

The classes attended will normally be evening or week-end classes, but in special cases, where a candidate is studying for an approved examination, permission may be given for attendance for a maximum period equivalent to one whole day per week. In such cases, the employee will be released from normal duties and will be paid for this period.

Electrodepositors' Meeting

Encouraging Annual Report

AT the annual general meeting of the Electrodepositors' Technical Society recently held in London, the hon. secretary, Dr. S. Wernick, presented an encouraging report for the past session. The society has held ten meetings in London and the same number in Birmingham.

At the inaugural meeting, held in London, the new president, Dr. Hepburn, delivered his presidential address "Alloy Deposition," a paper which will undoubtedly serve as a valuable source of reference for future research workers. In November an Electrodeposition Brains Trust was held, and in December, Mr. R. W. Harrison read a paper on the "Costing of Electroplating Processes," while Phosphate Coatings, which have come so much to the fore during the war, were dealt with in two complementary papers presented in January. Other papers were devoted to the Deposition of Brass, the Testing of Deposits, and to the Estimation of Ammonia in Cyanide Plating Solutions. Subjects discussed at Birmingham meetings include "Some Applications of Chromium Plating in Ordnance Manufacture," "Electrolytic Polishing of Metals" and "Costing of Electroplating Processes."

The results of the work of the joint committee on electro-deposition specifications, set up jointly by the Directorate of Technical Development of the Ministry of Aircraft Production and by this Society are evident from the official DTD Metal Finishing Specifications, while those specifications covering the Cleaning of Metals and the Anodic Oxidation of Aluminium have been fully revised. Specifications covering Zinc Plating, Chromium Plating, Nickel Plating and the Passivation of Zinc Surfaces are now under revision.

A CHEMIST'S BOOKSHELF

EXPERIMENTAL RESEARCHES AND REPORTS, Vol. XXV. Department of Glass Technology, University of Sheffield. Pp. 286. 21s.

Following its usual practice, Professor W. E. S. Turner's department has collected a year's most interesting reports on research into a single volume. The present volume deals with work done in 1942, and contains 14 papers. It will be noted that the cost of the volume has risen considerably since the last volume was published at 7s. 6d., but we think it will be generally admitted that the higher figure is commensurate with the amount and quality of the work involved. Miss Violet Dimbleby continues her useful work in summarising and giving references for the year's work on the chemical analysis and the investigation of the chemical properties and testing of glass and the raw materials in its make-up; while the annual report of the Glass Delegacy gives an impressive account of departmental activity. The technical papers are well illustrated and fully documented.

STORES CONTROL, by W. Nelson Wright. London: Rich. Madley, Ltd., 54 Grafton Way, W.1. Pp. 30. 2s.

In order to conduct business operations with the maximum efficiency, a sound stores control system is essential. Indeed, planning for production as well as distribution depend to a large extent on the smooth functioning of stores control.

The author—who is Stores Controller of Frederick Braby & Co., Ltd., London, N.W.1—discusses the essentials of stores control, adding illustrations of suitable record forms for general guidance. Any manufacturer wishing to organise or to improve stores control in his enterprise should find this booklet to be a valuable guide.

Personal Notes

DR. W. A. WATERS, formerly of Caius College, Cambridge, and now of Durham University, has been elected to an official fellowship in organic chemistry at Balliol College, Oxford.

MRS. CAROLINE CREYKE, the only surviving child of Sir John Bennet Lawes, founder of the superphosphate industry and agricultural scientist, attained her 100th birthday on December 4 and is in good health.

MR. H. GORDON FERGUSON, chairman of Cornbrook Chemical Co., Ltd., has accepted an invitation from the President of the Board of Trade to represent the British Colour Makers' Association on the Dyestuffs Control Advisory Committee, the chairman of which is the Controller of Dyestuffs, Mr. T. H. Hewlett, M.P.

DR. C. E. CHARDON, director of the Institute of Tropical Agriculture, Puerto Rico, has arrived in Barbados for the purpose of undertaking, jointly with PROFESSOR T. D. PATTERSON, of the Imperial College of Tropical Agriculture, a combined study of research institutions in the Caribbean with a view to the better co-ordination of their activities. Dr. Chardon is a mycologist, and has had specially valuable experience as head of agricultural missions to Colombia, Venezuela, and the Dominican Republic.

Swiss Chemical Industry

An American Report

THE U.S. Department of Commerce has recently published a detailed report of the Swiss chemical industry and its post-war prospects. It is being pointed out that the large sums which Swiss chemical enterprises are spending both on modernisation of plant and on research will guarantee them a good share of the world's international trade in chemicals. "The Swiss chemical and pharmaceutical industries," the report states, "are composed of up-to-date and well-organised units, disposing of considerable cash resources." The fact that all the leading companies have built up considerable reserves will make possible a speedy transfer to peace-time production, without the compulsion to carry out large-scale conversions. Swiss laboratories, it is stated, are capable of producing new and better products at competitive prices, especially if a return to more normal conditions and a more ample supply of goods should result in a lower general price level. Furthermore, Switzerland's chemical industry is laying great emphasis on exports at a time when the larger industrial nations cannot convert their capacity fully to peace-time needs.

Scandinavian Metals

Boliden's Report

FROM a statement recently made by Mr. Bengtssen, of Boliden A/B., the company does not expect to be able to maintain its present high level of employment after the war. He revealed further that, since the beginning of the war, the company's copper production had increased by about 50 per cent. to 16,000 tons annually. In 1940, production was started in the Christine mine, near Lycksele, and, in order to raise output, agreements were concluded with State-owned mines. The copper price increased by only 62 per cent., as compared with an increase of 210 per cent. for lead and of not less than 236 per cent. for zinc. At present, copper is being quoted at about 1540 kronor per ton, as compared with 1050 kr. before the war. He added that Sweden's total output of metals, excluding iron, had increased from the pre-war figure of 400,000 tons to 1,000,000 tons.

The Germans in Norway

According to recent advices received by THE CHEMICAL AGE, the Germans in Norway are liquidating their ambitious programme for a large-scale expansion of that country's light-metal industries. For instance, the A/S Nordag (*Nordische Aluminium A.G.*), controlled by the German Air Ministry, had invested several hundred million kroner and had planned a giant aluminium plant near Eitrheim. However, after having suspended building activities some time ago they are now reported to be evacuating machinery and, moreover, they have started to destroy several of the plants already begun, including that at Eitrheim. The original programme embraced the construction of four light-metal and alumina plants, as well as the expansion of three power stations; but only one alumina plant and one power station were completed.

Steel Standards

New B.S.I. Amendments

AMENDMENT slip No. 4 (Ref. P.D. 281) has been issued to B.S. 970, superseding all the previous amendments. It lists the alterations that have been made from time to time to the specifications: E.N.19, E.N.24, E.N.33, E.N.34, E.N.36, E.N.100, E.N.110. The numbers of specifications E.N.101 and E.N.102 have now been amended to E.N.201 and E.N.202.

In view of the above alterations a new memorandum to consumers (Ref. B.S. 970C) has been issued superseding 970B.

On application to the British Standards Institution, P.D.281 is obtainable gratis. Copies of B.S. 970C can be obtained at a cost of 6d. each or 3d. each for six or more.

General News

DTD Specification 599, "Non-Corrosive Flux for Soldering" (March, 1944), has just been reprinted, incorporating Amendment List No. 1 (H.M.S.O., 6d.).

The premises in Piccadilly, London, hitherto known as the Hotel Splendide, have been acquired by the Tunnel Portland Cement Company for use as offices, says a correspondent of *The Times*.

An interesting article on "The Purposes and Technique of Market Research," by A. G. Irvine, is the principal contribution to the latest issue of *Industrial Administration*, the journal of the Institute of Industrial Administration

A forecast that some relaxation of Government control in respect of certain of the company's products might be looked for in the near future was made by Mr. F. Woolley-Hart, O.B.E., chairman of British Tar Products, Ltd., at the annual meeting at Sheffield last week.

The Christmas spirit is fully evident in the current issue of "600," the house magazine of George Cohen, Sons & Co., Ltd., and associated companies. Stories, competitions, and pictures are well up to standard, and there is an interesting account of the dismantling of two old Cornish beam engines.

Notes on the economy of chromic acid in the electrodeposition and metal-finishing industries are contained in Technical Memorandum No. 1, issued by the Electrodeposition Technical Advisory Committee (representing M.O.S., M.A.P., and Admiralty).

Revised recommendations for tar surface dressings are given in "Wartime Road Note No. 8," just issued by the Road Research Laboratory, D.S.I.R. (H.M.S.O., 6d.). It is an adaptation of "Wartime Road Note No. 1," revised to conform with B.S. Specification 76-1943 for road tars, and extended to include new recommendations for surfacings on concrete, water-bound macadam, and wood blocks. A new appendix adds recommendations for special surface dressings, chiefly for aerodrome runways.

The recent discovery that beef extract is one of the richest sources of the vitamin nicotinic acid was commented on by Mr. K. M. Carlisle at the annual general meeting of Oxo, Ltd., in London last week. He pointed out how this discovery corroborates the popular idea that beef extract increases muscular efficiency and stamina, as has been further shown by a long series of controlled experiments in which nicotinic acid was added to the diet of healthy young adults.

From Week to Week

Leeds University has been asked to provide one-term and two-term courses for American and Dominion students while they are still in this country before being sent home.

Foreign News

The French rayon industry is reported to be at an almost complete standstill, due to the lack of chemical raw materials, the supply of which was dominated by Germany.

On the occasion of the fiftieth anniversary of the foundation of the Chemical, Metallurgical and Mining Society of South Africa, a commemoration issue of the Society's Journal has been issued.

Recently published figures show the mineral production in South Australia in 1943 to have been £25,432 higher in value than in 1942 in respect of metallic minerals, and £29,999 lower in non-metallic minerals.

The output of potash from Lake Campion, Western Australia, now stands at five tons per day. Modifications are being incorporated into the plant which will increase the daily output to 13 tons and reduce the cost to £14 per ton.

The Indian Science News Association records, in its ninth annual report, the gift of a further Rs.2500 for research scholarships from Adair, Dutt and Co., Ltd. Among other gifts received are a renewed grant of Rs.500 from the Bengal Chemical and Pharmaceutical Works, Ltd., and Rs.500 from the Calcutta Chemical Co., Ltd.

German coal production has been cut by about 75 per cent. by the Allied advances on the Western and Eastern Fronts, according to Dr. C. J. Potter, Deputy Administrator of the U.S. Solid Fuels Administration. He also disclosed that coal production in South Africa has increased 50 per cent. With equipment made available by the U.S., Great Britain has produced 12,000,000 tons of coal this year through strip mining. Before the war Great Britain did not produce any coal through strip mining.

The Swiss Society of Chemical Industry recently held its 64th annual meeting at Zurich. After having listened to a paper presented by Professor P. Scherrer on "Colours and Colour Vision," the Society awarded posthumuous honorary membership to Dr. Dürsteler, a former vice-chairman. The meeting approved a change of statute, transforming itself into an Association, and also confirmed Mr. C. Köchlin, of J. R. Geigy, A.G., Basle, as president, while Dr. R. C. Vetter, of Hoffmann-La Roche, was elected vice-president.

An oil shale research and development laboratory will be established at the University of Wyoming at Laramie, by the U.S. Bureau of Mines, according to an announcement by Mr. Harold L. Ickes, Secretary of the Interior. It will investigate oil shale, shale oil and products, and study their processing and utilisation.

A Swiss chemical and pharmaceutical enterprise, the Mühlethaler S.A. of Nyon, is issuing 4 per cent. debentures amounting to Francs 500,000, repayable after 15 years. The company doubled its share capital to Francs 700,000 last year. These transactions are, no doubt, being undertaken to provide capital for post-war activities.

Anti-trust actions will be resumed, upon the recommendation of President Roosevelt, against E.I. Du Pont de Nemours and against Röhm & Haas, both of which companies have been indicted on charges of cartel conspiracy with foreign interests regarding the manufacture of plastics, including those used in aircraft.

In the Protectorate of Bohemia and Moravia, rationalisation measures have been introduced into the pottery and china industries. In order to save fuel, a new heating process is said to have been developed, resulting in a lowering of the heating temperature by 100-150° C., without affecting the quality of the final product.

The cinnabar mines at Puhipuhi, New Zealand, are now reported to be capable of supplying the major part of the mercury requirements of Australia and New Zealand. First worked about 20 years ago, the mines have been twice abandoned, but an Auckland syndicate, helped by the Department of Mines, has been producing mercury there for the past two years.

The report of the committee appointed by the Government of India to advise the Council of Scientific and Industrial Research on the establishment of a Central Glass and Silicate Research Institute has now been published. Dr. Atma Ram, secretary to the committee, has presented the case in a critical and impartial manner, and there seems little doubt that the creation of such a research institute is justified. An initial expenditure of Rs.12 lacs would be succeeded by an annual expenditure of Rs.1½ lacs, rising to Rs.3 lacs—less than 1 per cent. of the total productive value of the industries concerned.

Forthcoming Events

The **Association for Scientific Photography** meets at Caxton Hall, S.W.1, on **December 30,** at 2.30 p.m., when papers on "The Choice of Materials for Scientific Photography," will be read by Dr. H. Baines and Mr. F. J. Tritton.

The Society of Chemical Industry meets on **January 1,** at 2.30 p.m., at Burlington House, to hear a paper on "Hydrogen Peroxide and Related Compounds in Industry," presented by Mr. V. W. Slater.

The Institution of the Rubber Industry meets on **January 1,** at 6.30 p.m., at Caxton Hall, Westminster, to hear the following papers: "Infra-red Radiation and its Application to Industrial Heating Processes," by L. J. C. Connell; and "High-Frequency Heating of Dielectrics," by N. R. Bligh.

The next meeting of the Birmingham section, **Electrodepositors' Technical Society,** will take place at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, on **January 2,** at 6 p.m., when a paper on "Black Finishes for Steel" will be presented by Mr. H. Silman.

The Royal Institute of Chemistry is holding the following Christmas lectures for children: at 2.45 p.m. in the Town Hall, Birmingham, on **January 2,** "Fire," and, on **January 5,** "Science in Antiquity." Both lectures will be given by Dr. J. A. Newton Friend.

The **British Association** announces a conference of its Division for the Social and International Relations of Science on "The Place of Science in Industry," to be held on **January 12** and **13** at the Royal Institution, Albemarle Street, London, W.1. The conference will be opened by Sir Richard Gregory, President of the Association, and there will be four sessions, at which the chair will be taken respectively by Mr. Ernest Bevin, Lord McGowan, Sir John Greenly and Lord Woolton. The subjects of the sessions will be: what industry owes to science, fundamental research in relation to industry, industrial research and development, and the future—what science might accomplish. A limited number of tickets will be available for the public, other than members of the Association, and may be applied for at the office of the British Association, Burlington House, London, W.1.

Company News

American Sugar Refining is paying a final dividend of $3 ($2).

Anglo-Chilean Nitrate Corporation report a net profit for the year to June 30, of £359,552 (£525,294).

Wm. Briggs and Sons, Ltd., announce a final dividend of 25 per cent. (20 per cent.) making 30 per cent. (25 per cent.).

Apex (Trinidad) Oilfields report a net profit, before tax, for the year to September 30, of £293,516 (£394,565). Taxation absorbs £100,000 (£190,000). The total dividend is again 30 per cent.

British Emulsifiers, Ltd., are paying an interim dividend of 10 per cent. for 1944. Accounts for 15 months to end of 1943 are not yet ready.

Eucryl, Ltd., announce a final dividend of 10 1/16 per cent., making 15 1/16 per cent. on deferred (same). Bonus, nil (7.15d. per share, making 21½ per cent.).

Canadian Industrial Alcohol reports a consolidated net profit to August 31, of $606,834 ($536,595); a dividend of 40 cents (35 cents) was declared. The net profit includes $61,678 ($69,600) earned by a Scottish subsidiary.

United Match Industries, Ltd., report a net profit for the year to October 31, of £12,475 (£12,081). A preferred ordinary dividend of 9½ per cent. (same) and an unchanged deferred ordinary of 33½ per cent. were declared.

The Eastern Chemical Co., Ltd., reports a trading profit of £62,822 (£56,609) and a net profit of £1961 (£4026) reducing adverse balance to £34,395. The directors, who have sold the company's assets in India, propose to place the company in voluntary liquidation which will be considered at a meeting to be held at Winchester House on January 11, at 2.15 p.m. The chairman suggests that the liquidator should pay 21s. 3d. on each participating ordinary share, and 26s. on each deferred share.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

NORTH BRITISH ALUMINIUM CO., LTD., London, E.C. (M., 30/12/44.) December 4, disposition by Miss Annie J. McIntyre with consent granted in implement of a Trust Deed dated September 12, 1934; charged on two pieces of land with Mayfield, Union Road, Fort William, and other buildings thereon. *—. March 28, 1944.

FORCE CRAG MINE, LTD., London, W.C., miners of barytes. (M., 30/12/44.) December 4, agreement, securing all moneys due or to become due to Merchants and General Finance Corporation, Ltd.; general charge.

Declarations of Solvency Filed

I.C.I. (ALKALI), LTD. (formerly Brunner Mond and Co., Ltd.), Slough, November 25. (D.S.F., 30/12/44.)

I.C.I. (PLASTICS), LTD., formerly Mouldrite, Ltd., and Croydon Mouldrite, Ltd.), Slough, November 2. (D.S.F., 30/12/44.)

New Companies Registered

Brynn Manufacturing Company, Ltd. (391,898).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals and drugs, etc. Directors: J. B. Morris, 1 Laurel Grove, Ashton-in-Makerfield, Lancs.; E. Halliwell.

Fumigants and Insecticides, Ltd. (391,876). Private company. Capital £1000 in £1 shares. Vermin, pest and germ exterminators, fumigators of ships, warehouses, etc. Directors: N. V. Barton, 10-12 Exhibition Road, London, S.W.7; J. Chapman.

Toxic Products, Ltd. (391,891).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemical and other preparations for exterminating vermin, fumigators of ships, warehouses, etc. Other particulars similar to those in Fumigants and Insecticides, Ltd. (*q.v.*).

Radi Chemicals, Ltd. (391,885).—Private company. Capital £100 in 1s. shares. Analytical, research, consulting and manufacturing chemists, etc. Directors: W. S. Stevens, 78 Upper Richmond Road, London, S.W.15; G. S. Bouldin, 71 Ravensbury Road, London, S.W.18.

Chemical and Allied Stocks and Shares

STOCK markets remained inactive owing to year-end influences, but were generally firm in the absence of selling and continue to be governed mainly by the trend of British funds. In accordance with the prevailing tendencies, movement in shares of chemical and related companies has been small.

Imperial Chemicals eased slightly to 38s. 10½d., but United Molasses after 38s. strengthened to 38s. 3d., and there was a

rally to 40s. 3d. in British Plaster Board. Yield on the 5s. units of the last-named company is little more than 3 per cent., but the 25 per cent. dividend was conservative and the market is assuming that a higher payment is not improbable for the current financial year. The units of the Distillers Company have been firm at 107s. 9d.; during recent years there has been an expansion of some of the varied activities of the group which after the war may be able to operate on a better margin of profit, permitting a return to pre-war dividend levels. British Glues and Chemicals 4s. ordinary units have moved higher at 9s., yielding not far short of 4½ per cent., which is quite an attractive return, bearing in mind the good dividend record over a long period of years.

Richard Thomas at 13s. 6d. and Baldwins at 6s. 9d. were little changed by the opposition which developed to the proposed big tinplate merger. Tube Investments at 108s. 1½d. held nearly all the further rise which followed the annual meeting. Elsewhere, United Steel were better at 26s. 3d., with Ruston & Hornsby firm at 49s. 3d., and Whitehead Iron & Steel held their rise to 87s. 6d.

British Celanese reacted sharply to 36s. immediately following the chairman's statement, reference to dividend prospects being regarded in the market as cautious. Courtaulds have been steady around 57s. 6d. Elsewhere, British Tar Products were 9s. 9d.; although the dividend on these 5s. units was reduced by 1 per cent. to 9 per cent., the recently-issued results show that if its profits had been fully distributed over 12¼ per cent. could have been paid. British Industrial Plastics remained at 7s., and Erinoid at 11s. 9d., with De La Rue firmer at 193s. 9d. At 37s. Borax Consolidated deferred were well maintained, yielding slightly over 4 per cent.; the market is assuming that the dividend is likely to be maintained at 7½ per cent. for the past financial year. Goodlass Wall 10s. ordinary eased, but later rallied to 18s. 9d. Pinchin Johnson were firmer at 39s. 3d., while still reflecting the dividend increase. Wailes Dove 5s. ordinary have changed hands up to 16s. 6d. In other directions, Murex strengthened from 100s. to 101s. 3d., but the shares of the Metal Box Co. lost a few pence at 91s. 3d. Dunlop Rubber kept steady at 48s. British Match were again 42s. 3d.; Wall Paper Manufacturers deferred units held firm at 44s. 3d. Nairn & Greenwich eased slightly to 76s. 10½d. Barry & Staines were 51s. 6d.

Greeff Chemicals 5s. ordinary were again 8s. 3d., Monsanto Chemicals 5½ per cent. preference 23s., and B. Laporte moved up to 83s. 9d., with Fisons 52s., W. J. Bush 70s., and British Drug Houses 29s. Elsewhere, Turner & Newall lost a few pence at 81s. 6d. Morgan Crucible 5½ per cent. preference were 27s. and the 5 per cent. preference 24s. 6d. United Glass Bottle ordinary have changed hands at 70s. Dividend of the last-named company, 12 per cent. for many years, has been substantially below earnings, further strength having been added to finance by building up reserves, etc. The company is strongly placed to meet the change-over to peace-time working, and there seems little doubt that this conserving of financial resources will prove to be to the ultimate benefit of shareholders. Boots Drug moved higher at 55s. 6d., and in other directions General Refractories were steady at 17s. 6d. Oil shares showed small movement; "Shell" strengthened to 83s. 1½d., but Apex moved back to 33s. 6d. on the lower profits.

British Chemical Prices

Market Reports

THE markets are quiet because of the holiday period, but firm price conditions characterise nearly all sections of the London general chemicals market and deliveries against contracts are proceeding along normal lines. In the soda products section, sustained pressure for supplies of bicarbonate of soda and chlorate of soda is reported and a steady demand is maintained for percarbonate of soda. Nitrate of soda is a good market with values well held, while limited offers of yellow prussiate of soda are finding a ready outlet. There are no important changes in the potash section, where supplies of yellow prussiate of potash continue scarce. Quotations for permanganate of potash are unchanged and acid phosphate of potash remains firm. In the coal-tar products section the chief activity is concerned with the deliveries against contract commitments, and prices generally remain strong.

MANCHESTER.—Trading on the Manchester chemical market this week made a quiet start after the holidays and is not likely to be in full swing again until the early part of next week. Up to the present, neither in heavy chemicals nor in coal-tar products has there been much new inquiry for actual fresh business, though deliveries under existing contracts are being steadily resumed after the holiday interruption. The general run of textile chemicals are likely to meet with a substantial demand from the rayon as well as the cotton and woollen sections, and the prospects are for reasonably active business for chemicals in the other leading outlets.

100 HYDRO EXTRACTORS by leading makers from 18 in. upwards, with Safety Covers. Jacketted Steam Copper and Iron Pans. Calorifiers-Washing Machines—Gilled Pipes, etc. List sent on request. Randalls, Engineers, Barnes. Tel.: Riv. 2436.

SERVICING

BOTTLING AND PACKING SERVICES.—Advertisers with up-to-date plant offer to bottle, label and pack any type of fluid from barrels or bulk supplies: All transactions strictly confidential. Box No. 2196, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3285 East

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Suppliers of Ground Silica and Fillers, etc. James Kent, Ltd. Millers, Fenton, Staffordshire. Telegrams: Kenmil, Stoke-on-Trent. Telephone: 4253 and 4254, Stoke-on-Trent (2 lines).

MONOMARK service. Permanent London address. Letters redirected. Confidential. 5s. p.a. Royal patronage. Write BM/MONO3C, W.C.1.

SITUATIONS VACANT

None of the advertisements below relates to a woman between 18 and 41 unless such a woman (a) has living with her a child of hers under the age of 14, or (b) is registered under the Blind Persons Acts, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

ASSISTANT CHIEF CHEMIST.—Applications are invited for a permanent superannuable appointment in Yorkshire. Essential qualifications are Supervision and direction of Laboratory Staff engaged in investigational work and routine testing of production samples in entomological, physical, organic and colloidal chemistry, with particular reference to detergents and emulsification. Lucid in preparation of reports. COMMITTEE EXPERIENCE. Salary £800 p.a. basic.

Applicants should write quoting F.3039 XA to the Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms which should be returned completed on or before 10th January, 1945.

ASSISTANT Works Manager required for Chemical Works in Northern Ireland. Applicant must have had a sound chemical engineering training, and be able to control labour. Age 25-35. Good prospects for suitable man. Write giving full details and salary expected to Box No. 2194 The Chemical Age, 154, Fleet Street, London, E.C.4.

WANTED

WANTED regularly, Residues, Sludge, Slag, etc., containing Antimony, Cadmium, Copper, Lead, Nickel and Zinc. Oakland Metal Company Ltd., Willington, Derby.

WANTED.—Supplies of Nitre Cake in ten-ton lots. Box No. 2126 THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

WANTED urgently, back numbers of THE CHEMICAL AGE, as follows:—
1944, August 19th.
1944, September 9th, 16th and 23rd.
1944, October 7th, 14th and 21st.
Please reply to THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers' Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY,

York House, 12 York Street, Manchester.

Telephone: 1937 (2 lines) Central, Manchester.

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